

Pre- and Post-Processing for Cosmic/NASTRAN
On Personal Computers and Mainframes

by

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Abstract

An interface between Cosmic/NASTRAN and GIFTS has recently been released, combining the powerful pre- and post-processing capabilities of GIFTS with Cosmic/NASTRAN's analysis capabilities. The interface operates on a wide range of computers, even linking Cosmic/NASTRAN and GIFTS when the two are on different computers. GIFTS offers a wide range of elements for use in model construction, each translated by the interface into the nearest Cosmic/NASTRAN equivalent; and the options of automatic or interactive modelling and loading in GIFTS make pre-processing easy and effective. The interface itself includes the programs GFTCOS, which creates the Cosmic/NASTRAN input deck (and, if desired, control deck) from the GIFTS Unified Data Base; COSGFT, which translates the displacements from the Cosmic/NASTRAN analysis back into GIFTS; and HOSTR, which handles stress computations for a few higher-order elements available in the interface, but not supported by the GIFTS processor STRESS. Finally, the versatile display options in GIFTS post-processing allow the user to examine the analysis results through an especially wide range of capabilities, including such possibilities as creating composite loading cases, plotting in color, and animating the analysis.

Introduction

The newly released interface between Cosmic/NASTRAN and GIFTS allows the user to combine GIFTS' pre- and post-processing capabilities with Cosmic/NASTRAN's analysis capabilities.

GIFTS pre-processors have a wide range of general-purpose capabilities for constructing and loading models interactively or automatically. Beam, spring, membrane, plate, shell, axisymmetric, and solid elements are available. Post-processing capabilities in GIFTS allow user-controlled display of displacements and stresses, beam shear and moment diagrams, deflected shapes superposed on undeflected, alphanumeric tables, and selected labels, element types, or portions of the model. GIFTS can also display plots in color and animate analysis results. The procedures for employing these capabilities are discussed below.

GIFTS and its interface with Cosmic/NASTRAN run on a wide variety of computers, including the IBM-PC AT and XT and their compatibles; larger IBM machines using CMS; VAX, Data General, and PRIME computers; and some UNIX implementations. It is possible to install both GIFTS and Cosmic/NASTRAN on the same computer (a VAX, for instance), or on different computers (say, a large IBM and a PC-AT). Thus the combination is well suited for networking.

The GIFTS-Cosmic/NASTRAN interface takes the form of two central programs: GFTCOS, to extract data from the GIFTS Unified Data Base and create ASCII input files for Cosmic/NASTRAN, and COSGFT, to return results obtained in Cosmic/NASTRAN to the GIFTS data base for post-processing. (A third program, HOSTR, assists with stress calculations for higher-order elements.) This interface supports many of Cosmic/NASTRAN's elements and features, and is scheduled for constant expansion updates to make use of new features in both Cosmic/NASTRAN and GIFTS. For instance, at present the interface supports both static analysis and vibrational mode extraction, with transient and buckling analysis expected in the next release.

Using the Interface

Before executing GFTCOS, the user constructs the desired model in GIFTS and assigns the desired loads and boundary conditions. The pre-processor BULKM (or BULKS for solid models) is used for efficient automatic mesh generation, with detailed editing capabilities available in EDITM (or EDITS). BULKF automatically suppresses degrees of freedom inappropriate to the model as constructed, and OPTIM optimizes the half-bandwidth, an essential step in preparing the model data for the interface. BULKLB and EDITLB (LOADS for solids) are then available for detailed application of loads, temperatures, and boundary conditions.

GFTCOS first examines the model for elements or material types not supported in the interface, notifying the user and terminating if it finds any. (See table below for correspondence between GIFTS elements and materials and their Cosmic/NASTRAN equivalents.) If the model is compatible with Cosmic/NASTRAN, GFTCOS then creates the Cosmic/NASTRAN input deck, producing two files in the process: the input file itself, named JOB.CNI, and a log file named JOB.CNL. The log file contains a record of all messages, prompts, and user responses executed while GFTCOS is running.

CORRESPONDENCE BETWEEN GIFTS AND COSMIC/NASTRAN ELEMENTS

GIFTS ELEMENT	TRANSLATED NASTRAN ELEMENT	GIFTS ANALYSIS
-----	-----	-----
BEAM2	CBAR	YES
QA4	CTRAPRU	YES
QB4	CQUAD2	YES
QM4	CQDMEM1	YES
QM9	CIS2D8 (8 POINTS)	YES
ROD2	CROD	YES
SLD8	CIHEX1 (8 POINTS)	YES
SLD27	CIHEX2 (20 POINTS)	NO
SPRING	CELAS2	YES
TA3	CTRIARG	YES
TB3	CTRIA2	YES
TB6	CTRSHL	NO
TET4	CTETRA	YES
TM3	CTRMEM	YES
TM6	CTRIMG	YES
TSPRING	CELAS2	YES

CORRESPONDENCE BETWEEN GIFTS AND COSMIC/NASTRAN MATERIALS

GIFTS MATERIAL	TRANSLATED NASTRAN MATERIAL	GIFTS ANALYSIS
-----	-----	-----
AALLOY	MAT1	YES
ELMAT	MAT1	YES
MSTEEL	MAT1	YES

The user can also choose to have GFTCOS create the Cosmic/NASTRAN control deck. In this case, the option of an eigen analysis is also offered, with the possibilities of using the determinant search, inverse power, givens, or modified givens method, and of normalizing the eigenvector with respect to the mass matrix, or using a selected point and freedom, or with the maximum deflection set to one.

Among the higher-order elements supported for the interface, GIFTS elements QM9 and SLD27 lack a direct counterpart in the Cosmic/NASTRAN library. Therefore, in translating GIFTS data into the Cosmic/NASTRAN input deck, GFTCOS transforms these elements into similar elements using fewer points (see element correspondence table) and notifies the user of the substitution via a message on the terminal screen. Local Cartesian, cylindrical, and spherical coordinate systems are preserved, as are prescribed displacements, loads, and temperatures. (Loads and temperatures are left untranslated when the user requests an eigen analysis.)

The Cosmic/NASTRAN input deck created by GFTCOS does not include an executive control deck; the user adds this after GFTCOS is run, by means of a text editor. At this time, the user can also edit the input deck itself, for instance by requesting output parameters in addition to the displacements handled by the interface.

The input deck is then submitted to Cosmic/NASTRAN for analysis. If GIFTS and Cosmic/NASTRAN are on different computers, of course the file must first be shipped across the link. The Cosmic/NASTRAN file produced at the end of analysis, containing displacements and stresses, must likewise be shipped back to the machine hosting GIFTS before COSGFT can be invoked.

COSGFT inserts the Cosmic/NASTRAN displacement results into the GIFTS data base. The stresses computed in Cosmic/NASTRAN are ignored, but the GIFTS post-processor STRESS can be called to recompute them for all elements fully supported in GIFTS. If the model contains other element types, such as higher-order solid and shell elements, the user can employ a special processor provided with the interface, named HOSTR, to compute approximate stress fields for them also.

The bulk of GIFTS' powerful post-processing capabilities are exercised via the post-processor RESULT. Here the user can examine all or any part of the model, labelling points, element or material types, and element sizing groups. Geometric entities and elements can be individually deleted from the plot and reactivated at will. Stress contours and vectors are available, as are shear, moment, and detailed cross-sectional plots of beams. Composite loading cases can be created and examined. A wide range of information commands allows tabular retrieval of selected subsets of data from the GIFTS data base. Color plotting permits especially clear, vivid display; and any display can be transferred to a hardcopy file. It is also possible to create animations of the analysis, for subsequent display with GIFTS post-processor VIDEO.

Example of Interface Applications

The following pages contain an example of a solid model constructed and loaded in GIFTS, analyzed in Cosmic/NASTRAN, and then examined in GIFTS. The structure is a pipe joint composed of solid elements and subjected to a combination of internal and external pressure. Printed here are the log file recording the interface procedure, the input file created from the GIFTS data base by the interface for use in Cosmic/NASTRAN, and a selection of plots from both pre- and post-processing in GIFTS. This example is only one demonstration of the way the GIFTS-Cosmic/NASTRAN interface turns GIFTS and Cosmic/NASTRAN into a single, complete general-purpose finite-element package which works on a number of computers, increasing the utility of both programs. Other interfaces are available to link GIFTS with still other programs, including many PC-based general drafting packages, thus expanding the user's capabilities still further.

Log File of GIFTS-Cosmic/NASTRAN Interface Procedure

\$ SET NOVERIFY

Directory DUA1:[COSMIC]

L004.NID;1 170 5-FEB-1986 11:03

Total of 1 file, 170 blocks.

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1-	CIHEX1 1	1	9	10	2	1	18	20	+H1	
2-	+H1 21	19								
3-	CIHEX1 2	1	18	20	21	19	37	39	+H2	
4-	+H2 40	38								
5-	CIHEX1 3	1	37	39	40	38	55	57	+H3	
6-	+H3 58	56								
7-	CIHEX1 4	1	55	57	58	56	73	75	+H4	
8-	+H4 76	74								
9-	CIHEX1 5	1	73	75	76	74	91	93	+H5	
10-	+H5 94	92								
11-	CIHEX1 6	1	91	93	94	92	109	111	+H6	
12-	+H6 112	110								
13-	CIHEX1 7	1	109	111	112	110	127	129	+H7	
14-	+H7 130	128								
15-	CIHEX1 8	1	127	129	130	128	145	147	+H8	
16-	+H8 148	146								
17-	CIHEX1 9	1	10	11	3	2	20	22	+H9	
18-	+H9 23	21								
19-	CIHEX1 10	1	20	22	23	21	39	41	+H10	
20-	+H10 42	40								
21-	CIHEX1 11	1	39	41	42	40	57	59	+H11	
22-	+H11 60	58								
23-	CIHEX1 12	1	57	59	60	58	75	77	+H12	
24-	+H12 78	76								
25-	CIHEX1 13	1	75	77	78	76	93	95	+H13	
26-	+H13 96	94								
27-	CIHEX1 14	1	93	95	96	94	111	113	+H14	
28-	+H14 114	112								
29-	CIHEX1 15	1	111	113	114	112	129	131	+H15	
30-	+H15 132	130								
31-	CIHEX1 16	1	129	131	132	130	147	149	+H16	
32-	+H16 150	148								
33-	CIHEX1 17	1	11	12	4	3	22	24	+H17	
34-	+H17 25	23								
35-	CIHEX1 18	1	22	24	25	23	41	43	+H18	
36-	+H18 44	42								
37-	CIHEX1 19	1	41	43	44	42	59	61	+H19	
38-	+H19 62	60								
39-	CIHEX1 20	1	59	61	62	60	77	79	+H20	
40-	+H20 80	78								
41-	CIHEX1 21	1	77	79	80	78	95	97	+H21	
42-	+H21 98	96								

continues

SORTED BULK DATA ECHO

CARD	COUNT	1	2	3	4	5	6	7	8	9	10
1387-	GRID	578	0	-21.00000.0	4.0000000				12456		
1388-	GRID	579	0	-21.0000.97545774.9039260					1456		
1389-	GRID	580	0	-21.0000.78034873.9231430					1456		
1390-	GRID	581	0	-21.00001.9134234.6193950					1456		
1391-	GRID	582	0	-21.00001.5307223.6955230					1456		
1392-	GRID	583	0	-21.00002.7778574.1573440					1456		
1393-	GRID	584	0	-21.00002.2222733.3258840					1456		
1394-	GRID	585	0	-21.00003.5355403.5355280					1456		
1395-	GRID	586	0	-21.00002.8284242.8284300					1456		
1396-	GRID	587	0	-21.00004.1573532.7778430					1456		
1397-	GRID	588	0	-21.00003.3258782.2222810					1456		
1398-	GRID	589	0	-21.00004.6194021.9134080					1456		
1399-	GRID	590	0	-21.00003.6955191.5307300					1456		
1400-	GRID	591	0	-21.00004.903929.97544340					1456		
1401-	GRID	592	0	-21.00003.923142.78035640					1456		
1402-	GRID	593	0	-21.00005.0000000.0	0				13456		
1403-	GRID	594	0	-21.00004.0000000.0	0				13456		
1404-	MAT1	1		.15000E8.60000E7.25000000.0	0.0	0.0	0.0	0.0			
1405-	MAT1	2		.30000E7.12500E7.20000000.0	0.0	0.0	0.0	0.0			
1406-	PIHEX	1	1								
1407-	PIHEX	2	2								
1408-	PIHEX	3	1								
1409-	PIHEX	4	2								
	ENDDATA										

*** USER INFORMATION MESSAGES FROM RESEQUENCING PROCESSOR - BANDIT (CRI= 1, MTH= 3, MPC= 2, DEP=-1, PCH=-1)

BEFORE RESEQUENCING - - -

BANDWIDTH 54
 PROFILE 18011
 MAX WAVEFRONT 54
 AVG WAVEFRONT 30.322
 RMS WAVEFRONT 32.604

AFTER RESEQUENCING BY GIBBS-POOLE-STOCKMEYER (GPS) ALGORITHM - - -

BANDWIDTH 46
 PROFILE 17407
 MAX WAVEFRONT 44
 AVG WAVEFRONT 29.305
 RMS WAVEFRONT 30.794

*** BANDIT SUMMARY ***

	BEFORE	AFTER
BANDWIDTH (B)	54	46
PROFILE (P)	18011	17407
MAXIMUM WAVEFRONT (C-MAX)	54	44
AVERAGE WAVEFRONT (C-AVG)	30.322	29.305
RMS WAVEFRONT (C-RMS)	32.604	30.794
NUMBER OF GRID POINTS (N)		594
NUMBER OF ELEMENTS (NON-RIGID)		256
NUMBER OF RIGID ELEMENTS PROCESSED		0
NUMBER OF MPC EQUATIONS PROCESSED		0
NUMBER OF COMPONENTS		1
MAXIMUM NODAL DEGREE		17
MINIMUM NODAL DEGREE		7
NUMBER OF UNIQUE EDGES		4553
MATRIX DENSITY, PERCENT		2.749
NUMBER OF POINTS OF ZERO DEGREE		0
BANDIT OPEN CORE		249412
CRITERION	RMS WAVEFRONT	
METHOD USED		GPS
NO. OF SEQGP CARDS GENERATED		149

SYSTEM GENERATED SEQGP CARDS,

SEQGP	1	2	2	4	3	6	4	8
SEQGP	5	10	6	12	7	14	8	18
SEQGP	9	1	10	3	11	5	12	7
SEQGP	13	9	14	11	15	13	16	15
SEQGP	17	17	18	19	19	20	20	21
SEQGP	21	22	22	23	23	24	24	25
SEQGP	25	26	26	27	27	28	28	29
SEQGP	29	30	30	31	31	32	32	16
SEQGP	33	33	34	34	35	35	36	36
SEQGP	37	37	38	38	39	39	40	40
SEQGP	41	41	42	42	43	43	44	44
SEQGP	45	45	46	46	47	47	48	48
SEQGP	49	49	50	50	51	51	52	52
SEQGP	53	53	54	54	55	55	56	56
SEQGP	57	57	58	58	59	59	60	60
SEQGP	61	61	62	62	63	63	64	64
SEQGP	65	65	66	66	67	67	68	68
SEQGP	69	69	70	70	71	71	72	72
SEQGP	73	73	74	74	75	75	76	76
SEQGP	77	77	78	78	79	79	80	80

continues

SEQGP	509	174	510	173	511	168	512	167
SEQGP	513	176	514	175	515	166	516	165
SEQGP	517	178	518	177	519	164	520	163
SEQGP	521	180	522	179	523	563	524	564
SEQGP	525	565	526	566	527	567	528	568
SEQGP	529	569	530	570	531	555	532	556
SEQGP	533	537	534	538	535	515	536	516
SEQGP	537	489	538	490	539	459	540	460
SEQGP	541	577	542	578	543	579	544	580
SEQGP	545	581	546	582	547	571	548	572
SEQGP	549	557	550	558	551	539	552	540
SEQGP	553	517	554	518	555	491	556	492
SEQGP	557	461	558	462	559	587	560	588
SEQGP	561	589	562	590	563	583	564	584
SEQGP	565	573	566	574	567	559	568	560
SEQGP	569	541	570	542	571	519	572	520
SEQGP	573	493	574	494	575	463	576	464
SEQGP	577	594	578	593	579	591	580	592
SEQGP	581	585	582	586	583	575	584	576
SEQGP	585	561	586	562	587	543	588	544
SEQGP	589	521	590	522	591	495	592	496
SEQGP	593	465	594	466				

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

*** USER INFORMATION MESSAGE, TURN DIAG 38 ON FOR ADDITIONAL ELEMENT PROCESSING INFORMATION

*** USER FATAL MESSAGE 3302, IHEX1 ELEMENT NO. 116 ILLEGAL GEOMETRY, ALFA EXCEEDED.

*** USER FATAL MESSAGE 3302, IHEX1 ELEMENT NO. 124 ILLEGAL GEOMETRY, ALFA EXCEEDED.

*** USER FATAL MESSAGE 3302, IHEX1 ELEMENT NO. 213 ILLEGAL GEOMETRY, ALFA EXCEEDED.

*** USER FATAL MESSAGE 3302, IHEX1 ELEMENT NO. 221 ILLEGAL GEOMETRY, ALFA EXCEEDED.

*** USER FATAL MESSAGE 3302, IHEX1 ELEMENT NO. 221 ILLEGAL GEOMETRY, ALFA EXCEEDED.

***USER INFORMATION MESSAGE 3023--PARAMETERS FOR REAL SYMMETRIC DECOMPOSITION OF DATA BLOCK KLL (N = 1596)
TIME ESTIMATE= 20586 C AVG = 81 PC AVG = 0 SPILL GROUPS = 0 S AVG = 1
ADDITIONAL CORE=-227859 C MAX = 122 PCMAX = 0 PC GROUPS = 0 PREFACE LOOPS = 1

*** USER INFORMATION MESSAGE 3035

FOR LOAD 1 EPSILON SUB E = 1.2422739E-15

GIFTS LOAD CASE:1

SUBCASE 1

D I S P L A C E M E N T V E C T O R

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1	G	0.0	0.0	-1.412810E-03	0.0	0.0	0.0
2	G	0.0	-8.293360E-05	-1.368316E-03	0.0	0.0	0.0
3	G	0.0	-1.434956E-04	-1.242397E-03	0.0	0.0	0.0
4	G	0.0	-1.666498E-04	-1.053474E-03	0.0	0.0	0.0
5	G	0.0	-1.495623E-04	-8.347788E-04	0.0	0.0	0.0
6	G	0.0	-1.023543E-04	-6.065379E-04	0.0	0.0	0.0
7	G	0.0	-4.450929E-05	-3.889870E-04	0.0	0.0	0.0
8	G	0.0	1.944273E-05	0.0	0.0	0.0	0.0
9	G	0.0	0.0	-1.379316E-03	0.0	0.0	0.0
10	G	0.0	-1.610228E-04	-1.318456E-03	0.0	0.0	0.0
11	G	0.0	-2.777156E-04	-1.149825E-03	0.0	0.0	0.0
12	G	0.0	-3.203591E-04	-9.107926E-04	0.0	0.0	0.0
13	G	0.0	-2.834938E-04	-6.502475E-04	0.0	0.0	0.0
14	G	0.0	-1.873774E-04	-4.133017E-04	0.0	0.0	0.0
15	G	0.0	-7.080255E-05	-2.277407E-04	0.0	0.0	0.0
16	G	0.0	2.224120E-05	-9.671461E-05	0.0	0.0	0.0
17	G	0.0	5.753958E-05	0.0	0.0	0.0	0.0
18	G	-6.841561E-05	0.0	-1.386334E-03	0.0	0.0	0.0
19	G	-5.449258E-05	0.0	-1.420199E-03	0.0	0.0	0.0
20	G	-6.868053E-05	-1.617761E-04	-1.325242E-03	0.0	0.0	0.0
21	G	-5.521253E-05	-8.346338E-05	-1.375516E-03	0.0	0.0	0.0
22	G	-6.941930E-05	-2.790896E-04	-1.155956E-03	0.0	0.0	0.0
23	G	-5.725115E-05	-1.444824E-04	-1.249049E-03	0.0	0.0	0.0
24	G	-7.048190E-05	-3.221241E-04	-9.159508E-04	0.0	0.0	0.0
25	G	-6.026979E-05	-1.679666E-04	-1.061282E-03	0.0	0.0	0.0
26	G	-7.166900E-05	-2.853871E-04	-6.542657E-04	0.0	0.0	0.0
27	G	-6.378039E-05	-1.510606E-04	-8.395361E-04	0.0	0.0	0.0
28	G	-7.278436E-05	-1.891781E-04	-4.161623E-04	0.0	0.0	0.0
29	G	-6.723651E-05	-1.039039E-04	-6.101293E-04	0.0	0.0	0.0
30	G	-7.367384E-05	-7.239363E-05	-2.295345E-04	0.0	0.0	0.0
31	G	-7.012354E-05	-4.602856E-05	-3.913739E-04	0.0	0.0	0.0
32	G	0.0	1.835273E-06	-1.884948E-04	0.0	0.0	0.0
33	G	-7.423946E-05	2.084744E-05	-9.756794E-05	0.0	0.0	0.0
34	G	-7.203059E-05	3.674250E-07	-1.896816E-04	0.0	0.0	0.0
35	G	-7.443262E-05	5.622514E-05	0.0	0.0	0.0	0.0
36	G	-7.269604E-05	1.799822E-05	0.0	0.0	0.0	0.0
37	G	-1.333498E-04	0.0	-1.405247E-03	0.0	0.0	0.0
38	G	-1.112928E-04	0.0	-1.440140E-03	0.0	0.0	0.0
39	G	-1.339938E-04	-1.636622E-04	-1.343518E-03	0.0	0.0	0.0
40	G	-1.127926E-04	-8.469930E-05	-1.394937E-03	0.0	0.0	0.0
41	G	-1.357890E-04	-2.824959E-04	-1.172427E-03	0.0	0.0	0.0
42	G	-1.170397E-04	-1.467525E-04	-1.266974E-03	0.0	0.0	0.0

continues

589	G	0.0	-1.015947E-03	2.145764E-04	0.0	0.0	0.0
590	G	0.0	-1.181167E-03	6.788397E-04	0.0	0.0	0.0
591	G	0.0	-1.383135E-03	4.928993E-05	0.0	0.0	0.0
592	G	0.0	-1.412404E-03	3.188860E-04	0.0	0.0	0.0
593	G	0.0	-1.520760E-03	0.0	0.0	0.0	0.0
594	G	0.0	-1.496575E-03	0.0	0.0	0.0	0.0

*** SYSTEM WARNING MESSAGE 3022

DATA BLOCK PLTPAR IS REQUIRED AS INPUT AND IS NOT OUTPUT BY A PREVIOUS MODULE IN THE CURRENT DMAP ROUTE.

*** SYSTEM WARNING MESSAGE 3022

DATA BLOCK GPSETS IS REQUIRED AS INPUT AND IS NOT OUTPUT BY A PREVIOUS MODULE IN THE CURRENT DMAP ROUTE.

*** SYSTEM WARNING MESSAGE 3022

DATA BLOCK ELSETS IS REQUIRED AS INPUT AND IS NOT OUTPUT BY A PREVIOUS MODULE IN THE CURRENT DMAP ROUTE.

* * * END OF JOB * * *

11:06:34	0.0 ELAPSED SECONDS	0.0 CPU SECONDS	SEM1	BEGN		
11:06:40	6.0 ELAPSED SECONDS	3.0 CPU SECONDS	GNFI			
11:06:41	7.0 ELAPSED SECONDS	3.0 CPU SECONDS	TTIO			
11:08:01	87.0 ELAPSED SECONDS	74.0 CPU SECONDS	TTLP			
11:09:23	169.0 ELAPSED SECONDS	155.0 CPU SECONDS	XCSA			
11:09:39	185.0 ELAPSED SECONDS	168.0 CPU SECONDS	IFP1			
11:09:43	189.0 ELAPSED SECONDS	171.0 CPU SECONDS	XSOR			
11:12:12	338.0 ELAPSED SECONDS	305.0 CPU SECONDS	IFP	BEGN		
11:14:02	448.0 ELAPSED SECONDS	407.0 CPU SECONDS	IFP	END		
11:14:02	448.0 ELAPSED SECONDS	407.0 CPU SECONDS	XGPI			
11:14:21	467.0 ELAPSED SECONDS	425.0 CPU SECONDS	BAND	IT	BEGN11:15:34	541.0 ELAPSED SECONDS 478.0 CPU
SECONDS	BAND					
END						
11:15:36	542.0 ELAPSED SECONDS	478.0 CPU SECONDS	SEM1	END		
11:15:42	548.0 ELAPSED SECONDS	480.0 CPU SECONDS	LINK	1	END	
11:15:42	548.0 ELAPSED SECONDS	480.0 CPU SECONDS	---	---	---	
11:15:55	561.0 ELAPSED SECONDS	485.0 CPU SECONDS	LINK	2	BEGN	
11:15:55	561.0 ELAPSED SECONDS	486.0 CPU SECONDS	5	PARAM	BEGN	
11:15:55	561.0 ELAPSED SECONDS	486.0 CPU SECONDS	5	PARAM	END	
11:15:55	561.0 ELAPSED SECONDS	486.0 CPU SECONDS	XSFA	BEGN11:15:58		564.0 ELAPSED SECONDS 487.0 CPU
SECONDS	XSFA					
END						
11:15:59	565.0 ELAPSED SECONDS	487.0 CPU SECONDS	6	GP1	BEGN	
11:17:01	628.0 ELAPSED SECONDS	536.0 CPU SECONDS	6	GP1	END	
11:17:02	628.0 ELAPSED SECONDS	536.0 CPU SECONDS	7	PLTTRAN	BEGN	
11:17:09	635.0 ELAPSED SECONDS	541.0 CPU SECONDS	7	PLTTRAN	END	
11:17:09	635.0 ELAPSED SECONDS	541.0 CPU SECONDS	8	GP2	BEGN	
11:17:14	640.0 ELAPSED SECONDS	544.0 CPU SECONDS	8	GP2	END	
11:17:14	640.0 ELAPSED SECONDS	544.0 CPU SECONDS	9	PARAML	BEGN	
11:17:14	640.0 ELAPSED SECONDS	544.0 CPU SECONDS	9	PARAML	END	
continues						
20:16:09	32975.0 ELAPSED SECONDS	32388.0 CPU SECONDS		XSFA	BEGN	
20:16:11	32977.0 ELAPSED SECONDS	32389.0 CPU SECONDS		XSFA	END	
20:16:11	32977.0 ELAPSED SECONDS	32389.0 CPU SECONDS	140	SCAN	BEGN	
20:16:11	32977.0 ELAPSED SECONDS	32389.0 CPU SECONDS	140	SCAN	END	
20:16:12	32978.0 ELAPSED SECONDS	32389.0 CPU SECONDS	141	OFFP	BEGN	
20:16:12	32978.0 ELAPSED SECONDS	32389.0 CPU SECONDS	141	OFFP	END	
20:16:12	32978.0 ELAPSED SECONDS	32389.0 CPU SECONDS	142	OFFP	BEGN	
20:16:12	32978.0 ELAPSED SECONDS	32389.0 CPU SECONDS	142	OFFP	END	
20:16:12	32978.0 ELAPSED SECONDS	32389.0 CPU SECONDS	144	COND	BEGN	
20:16:12	32978.0 ELAPSED SECONDS	32390.0 CPU SECONDS	144	COND	END	
20:16:13	32979.0 ELAPSED SECONDS	32390.0 CPU SECONDS	149	COND	BEGN	
20:16:13	32979.0 ELAPSED SECONDS	32390.0 CPU SECONDS	149	COND	END	
20:16:13	32979.0 ELAPSED SECONDS	32390.0 CPU SECONDS	163	PURGE	BEGN	
20:16:13	32979.0 ELAPSED SECONDS	32390.0 CPU SECONDS	163	PURGE	END	
20:16:13	32979.0 ELAPSED SECONDS	32390.0 CPU SECONDS	164	EXIT	BEGN	

Directory DUA1:(COSMIC)

Total of 50 files, 4444/4509 blocks.

COSMIC job terminated at 5-FEB-1986 20:16:39.84

Accounting information:

Buffered I/O count:	1757	Peak working set size:	512
Direct I/O count:	6838	Peak page file size:	3253
Page faults:	28863	Mounted volumes:	0
Charged CPU time:	0 09:00:11.17	Elapsed time:	0 09:10:20.79

Input File For Use in Cosmic/NASTRAN

TITLE = GIFTS MODEL:L004

OUTPUT

DISP = ALL

SUBCASE 1.

LABEL = GIFTS LOAD CASE:1

LOAD = 1

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GRID	3	0	0.	1.5307223	.6955230	1456
GRID	4	0	0.	2.222733	.3258840	1456
GRID	5	0	0.	2.8284242	.8284300	1456
GRID	6	0	0.	3.3258782	.2222810	1456
GRID	7	0	0.	3.6955191	.5307300	1456
GRID	8	0	0.	4.0000000	0	13456
GRID	9	0	0.	0.	5.0000000	12456
GRID	10	0	0.	.97545774	.9039260	1456
GRID	11	0	0.	1.9134234	.6193950	1456
GRID	12	0	0.	2.7778574	.1573440	1456
GRID	13	0	0.	3.5355403	.5355280	1456
GRID	14	0	0.	4.1573532	.7778430	1456
GRID	15	0	0.	4.6194021	.9134080	1456
GRID	16	0	0.	4.903929	.97544340	1456
GRID	17	0	0.	5.0000000	0	13456
GRID	18	0	-.8750000	5.0000000		2456
GRID	19	0	-.8750000	4.0000000		2456
GRID	20	0	-.875000	.97545774	.9039260	456
GRID	21	0	-.875000	.78034403	.9231440	456
GRID	22	0	-.8750001	.9134234	.6193950	456
GRID	23	0	-.8750001	.5307173	.6955250	456
GRID	24	0	-.8750002	.7778574	.1573440	456
GRID	25	0	-.8750002	.2222713	.3258860	456

continues

GRID	555	0	-19.01664	.907369	.95798270	456
GRID	556	0	-18.61203	.930016	.74496690	456
GRID	557	0	-19.00005	.0000000	0	3456
GRID	558	0	-18.50004	.0000000	0	3456
GRID	559	0	-20.12500	5.0000000		2456
GRID	560	0	-20.12500	4.0000000		2456
GRID	561	0	-20.1059	.96650064	.9057000	456
GRID	562	0	-20.0922	.76348823	.9264590	456
GRID	563	0	-20.08661	.9035634	.6234680	456
GRID	564	0	-20.05551	.5103103	.7039130	456
GRID	565	0	-20.06772	.7721614	.1611440	456
GRID	566	0	-20.01422	.2085223	.3350320	456
GRID	567	0	-20.04983	.5353783	.5356900	456
GRID	568	0	-19.96802	.8255032	.8313470	456
GRID	569	0	-20.03354	.1609192	.7725000	456
GRID	570	0	-19.91713	.3313712	.2140380	456
GRID	571	0	-20.01944	.6233521	.9038400	456
GRID	572	0	-19.86253	.7028761	.5128480	456
GRID	573	0	-20.00814	.905668	.96665020	456
GRID	574	0	-19.80603	.926577	.76288970	456
GRID	575	0	-20.00005	.0000000	0	3456
GRID	576	0	-19.75004	.0000000	0	3456
GRID	577	0	-21.00000	5.0000000		12456
GRID	578	0	-21.00000	4.0000000		12456
GRID	579	0	-21.0000	.97545774	.9039260	1456
GRID	580	0	-21.0000	.78034873	.9231430	1456
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GRID	582	0	-21.00001	.5307223	.6955230	1456

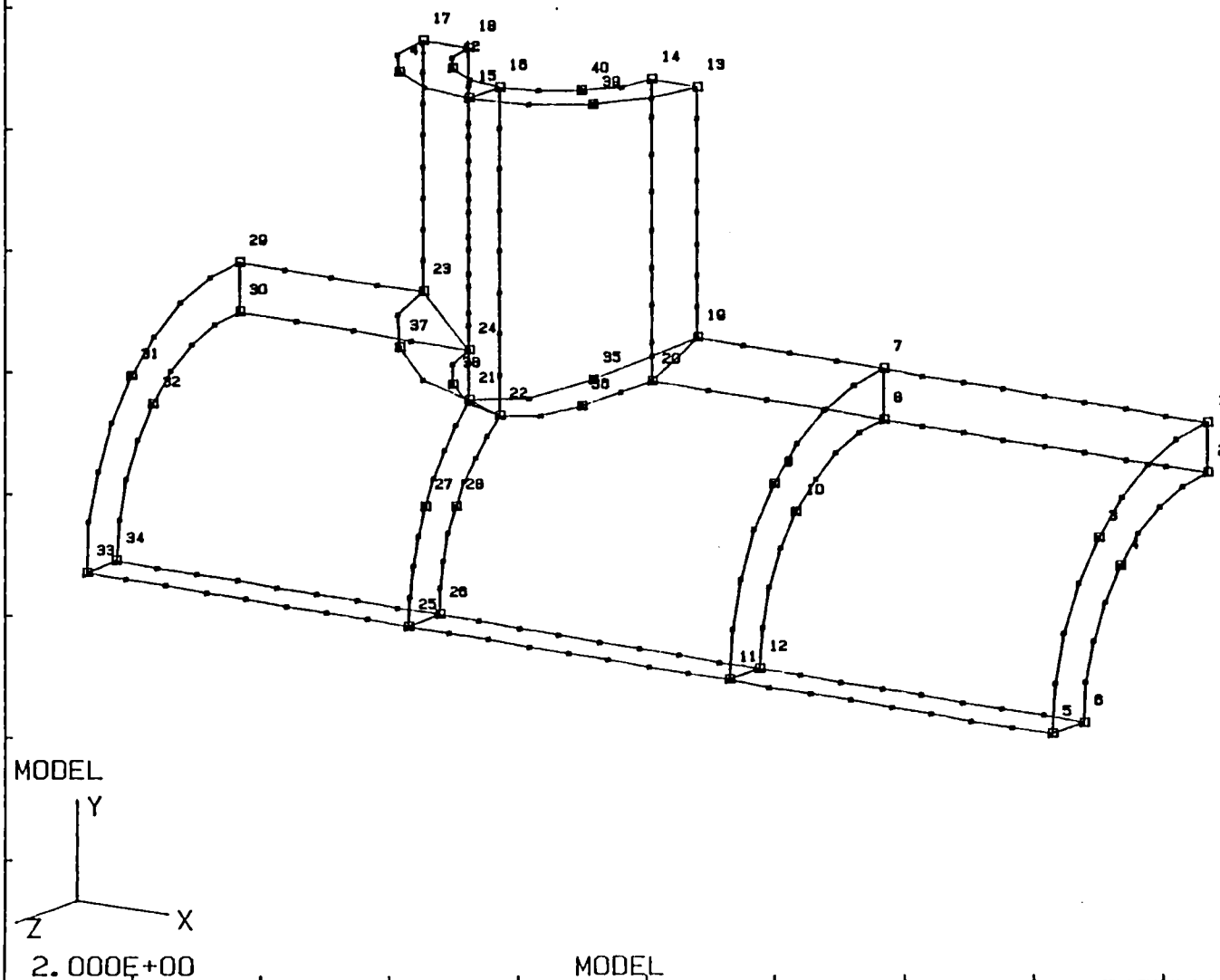
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GRID	594	0	-21.00004.0000000.	0	13456				
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MAT1	2		.30000E7.12500E7.20000000.	0.	0.	0.			
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CIHEX1	1	1	9	10	2	1	18	20	+H1
+H1	21	19							
CIHEX1	2	1	18	20	21	19	37	39	+H2
+H2	40	38							
CIHEX1	3	1	37	39	40	38	55	57	+H3
+H3	58	56							
CIHEX1	4	1	55	57	58	56	73	75	+H4
+H4	76	74							
CIHEX1	5	1	73	75	76	74	91	93	+H5
+H5	94	92							
CIHEX1	6	1	91	93	94	92	109	111	+H6
+H6	112	110							
CIHEX1	7	1	109	111	112	110	127	129	+H7
+H7	130	128							
CIHEX1	8	1	127	129	130	128	145	147	+H8
+H8	148	146							
CIHEX1	9	1	10	11	3	2	20	22	+H9
+H9	23	21							
CIHEX1	10	1	20	22	23	21	39	41	+H10
+H10	42	40							
CIHEX1	11	1	39	41	42	40	57	59	+H11
+H11	60	58							
CIHEX1	12	1	57	59	60	58	75	77	+H12
+H12	78	76							
CIHEX1	13	1	75	77	78	76	93	95	+H13
+H13	96	94							
CIHEX1	14	1	93	95	96	94	111	113	+H14
+H14	114	112							
CIHEX1	15	1	111	113	114	112	129	131	+H15
+H15	132	130							
CIHEX1	16	1	129	131	132	130	147	149	+H16
+H16	150	148							
CIHEX1	17	1	11	12	4	3	22	24	+H17
+H17	25	23							
CIHEX1	18	1	22	24	25	23	41	43	+H18
+H18	44	42							
CIHEX1	19	1	41	43	44	42	59	61	+H19
+H19	62	60							
CIHEX1	20	1	59	61	62	60	77	79	+H20
+H20	80	78							
CIHEX1	21	1	77	79	80	78	95	97	+H21
+H21	98	96							
CIHEX1	22	1	95	97	98	96	113	115	+H22
+H22	116	114							
CIHEX1	23	1	113	115	116	114	131	133	+H23
+H23	134	132							

CIHEX1	24	1	131	133	134	132	149	151	+H24
+H24	152	150							
CIHEX1	25	1	12	13	5	4	24	26	+H25
+H25	27	25							
CIHEX1	26	1	24	26	27	25	43	45	+H26
+H26	46	44							
CIHEX1	27	1	43	45	46	44	61	63	+H27
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CIHEX1	224	3	297	299	300	298	327	329	+H224
+H224	330	328							
PIHEX	4	2							
CIHEX1	225	4	489	490	492	491	443	444	+H225
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CIHEX1	226	4	491	492	494	493	445	446	+H226
+H226	448	447							
CIHEX1	227	4	493	494	496	495	447	448	+H227
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CIHEX1	228	4	495	496	498	497	449	450	+H228
+H228	452	451							
CIHEX1	229	4	497	498	500	499	451	452	+H229
+H229	454	453							
CIHEX1	230	4	499	500	502	501	453	454	+H230
+H230	456	455							
CIHEX1	231	4	501	502	504	503	455	456	+H231
+H231	470	469							
CIHEX1	232	4	503	504	522	521	469	470	+H232
+H232	518	517							
CIHEX1	233	4	443	444	446	445	401	402	+H233
+H233	404	403							
CIHEX1	234	4	445	446	448	447	403	404	+H234
+H234	406	405							
CIHEX1	235	4	447	448	450	449	405	406	+H235
+H235	408	407							
CIHEX1	236	4	449	450	452	451	407	408	+H236
+H236	410	409							
CIHEX1	237	4	451	452	454	453	409	410	+H237
+H237	412	411							
CIHEX1	238	4	453	454	456	455	411	412	+H238
+H238	422	421							
CIHEX1	239	4	455	456	470	469	421	422	+H239
+H239	466	465							
CIHEX1	240	4	469	470	518	517	465	466	+H240
+H240	514	513							
CIHEX1	241	4	401	402	404	403	363	364	+H241
+H241	366	365							
CIHEX1	242	4	403	404	406	405	365	366	+H242
+H242	368	367							
CIHEX1	243	4	405	406	408	407	367	368	+H243
+H243	370	369							
CIHEX1	244	4	407	408	410	409	369	370	+H244
+H244	372	371							
CIHEX1	245	4	409	410	412	411	371	372	+H245
+H245	378	377							
CIHEX1	246	4	411	412	422	421	377	378	+H246
+H246	418	417							
CIHEX1	247	4	421	422	466	465	417	418	+H247
+H247	462	461							
CIHEX1	248	4	465	466	514	513	461	462	+H248
+H248	510	509							
CIHEX1	249	4	363	364	366	365	329	330	+H249
+H249	332	331							

CIHEX1	250	4	365	366	368	367	331	332	+H250
+H250	334	333							
CIHEX1	251	4	367	368	370	369	333	334	+H251
+H251	336	335							
CIHEX1	252	4	369	370	372	371	335	336	+H252
+H252	338	337							
CIHEX1	253	4	371	372	378	377	337	338	+H253
+H253	374	373							
CIHEX1	254	4	377	378	418	417	373	374	+H254
+H254	414	413							
CIHEX1	255	4	417	418	462	461	413	414	+H255
+H255	458	457							
CIHEX1	256	4	461	462	510	509	457	458	+H256
+H256	506	505							
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FORCE	1	3	0	170.7047-	.73E-6	-.382681-	.923881		
FORCE	1	4	0	170.7053-	.263E-7-	.555568-	.831471		
FORCE	1	5	0	170.7053.	.5430E-6-	.707106-	.707107		
FORCE	1	6	0	170.7052.	.4778E-6-	.831470-	.555570		
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FORCE	1	48	0	341.4121.	.7806E-6-	.831470-	.555569		
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FORCE	1	88	0	341.4009.	.5092E-6-	.980786-	.195087		
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FORCE	1	96	0	341.4104-	.124E-6-	.382677-	.923882		
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FORCE	1	540	0	222.4615-.001473.9959748.0896217
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FORCE	1	572	0	445.6563-.001361.9269736.3751231
FORCE	1	574	0	459.6250-.001610.9820634.1885440
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FORCE	1	592	0	231.3876-.001590.9818138.1898394
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KEY POINTS

VIEW DIR.:
53 27 80

VIEWING DIST.
1.000E+16

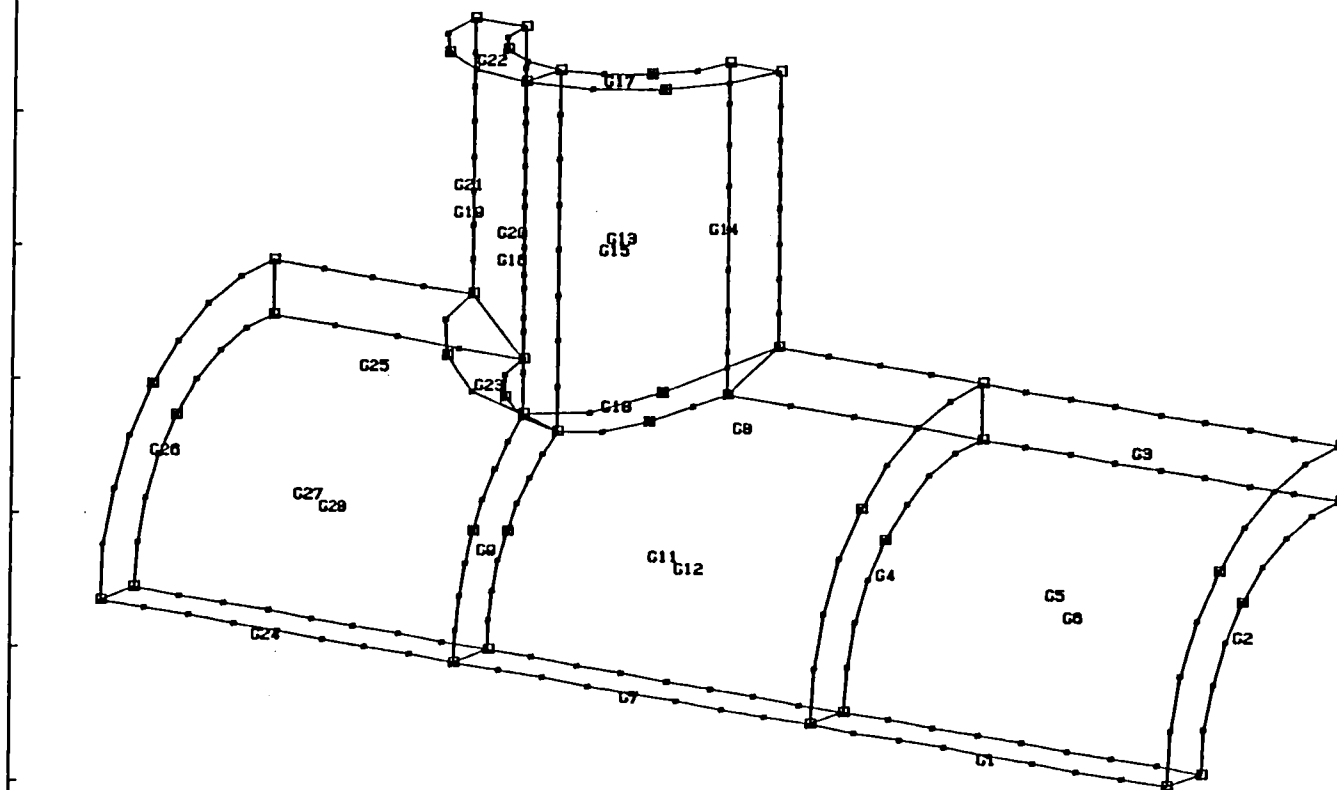
PLOT LIMITS

X -2.100E+01
0.000E-01

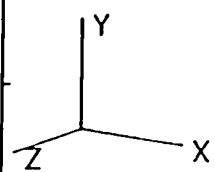
Y 0.000E-01
1.000E+01

Z 0.000E-01
5.000E+00

JOB: L004
02/06/86 11:02



MODEL



2.000E+00

MODEL

GRID NAMES

VIEW DIR.:
53 27 80

VIEWING DIST.
1.000E+16

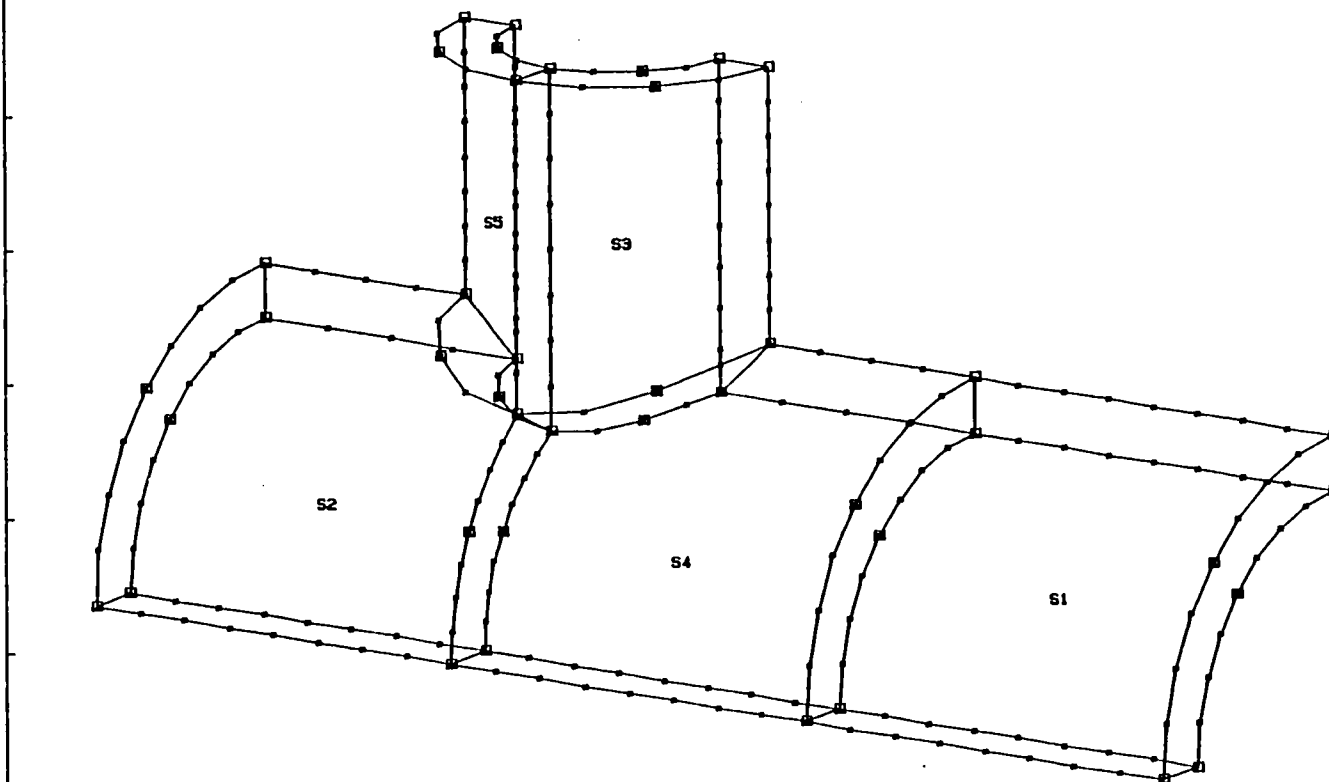
PLOT LIMITS

X -2.100E+01
0.000E-01

Y 0.000E-01
1.000E+01

Z 0.000E-01
5.000E+00

JOB: L004
02/06/86 11:03



MODEL

Y

X

Z

2.000E+00

MODEL

SOLID NAMES

VIEW DIR.:
53 27 80

VIEWING DIST.
1.000E+16

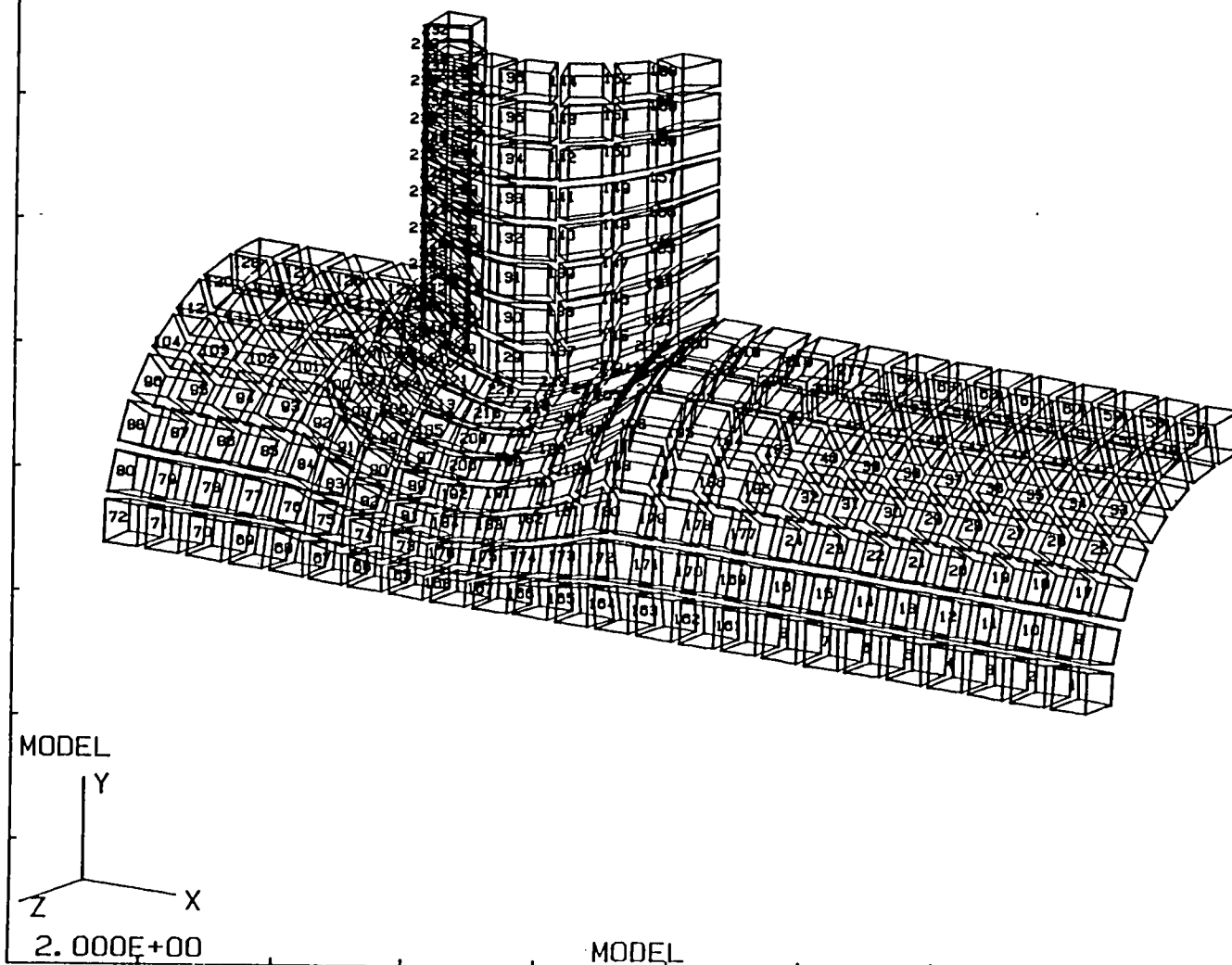
PLOT LIMITS

X -2.100E+01
0.000E-01

Y 0.000E-01
1.000E+01

Z 0.000E-01
5.000E+00

JOB: L004
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ELT. NOS.

53	VIEW DIR. :	27	80
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VIEWING DIST.	1.000E+16
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PLOT LIMITS

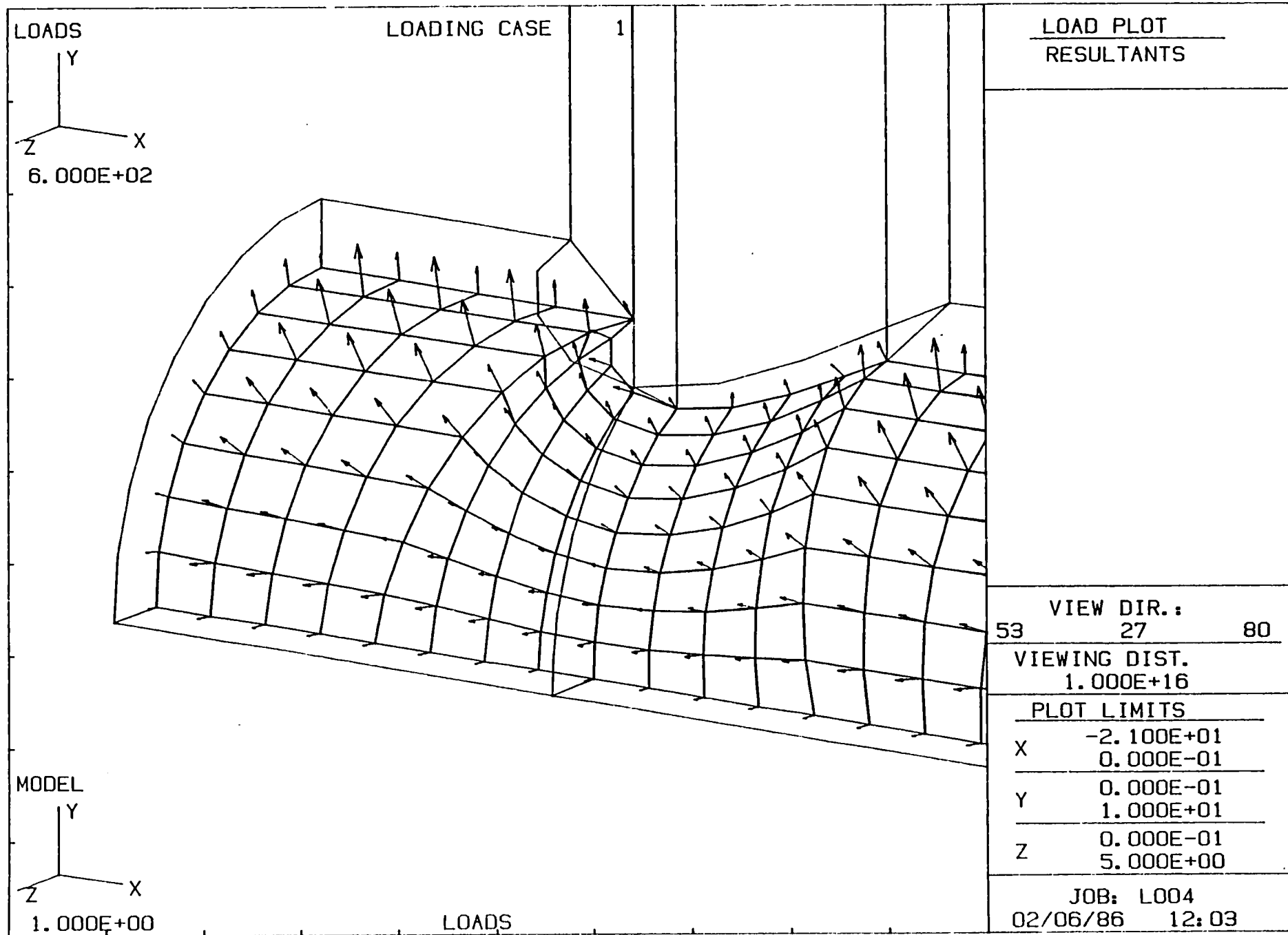
X	-2.100E+01	0.000E-01
---	------------	-----------

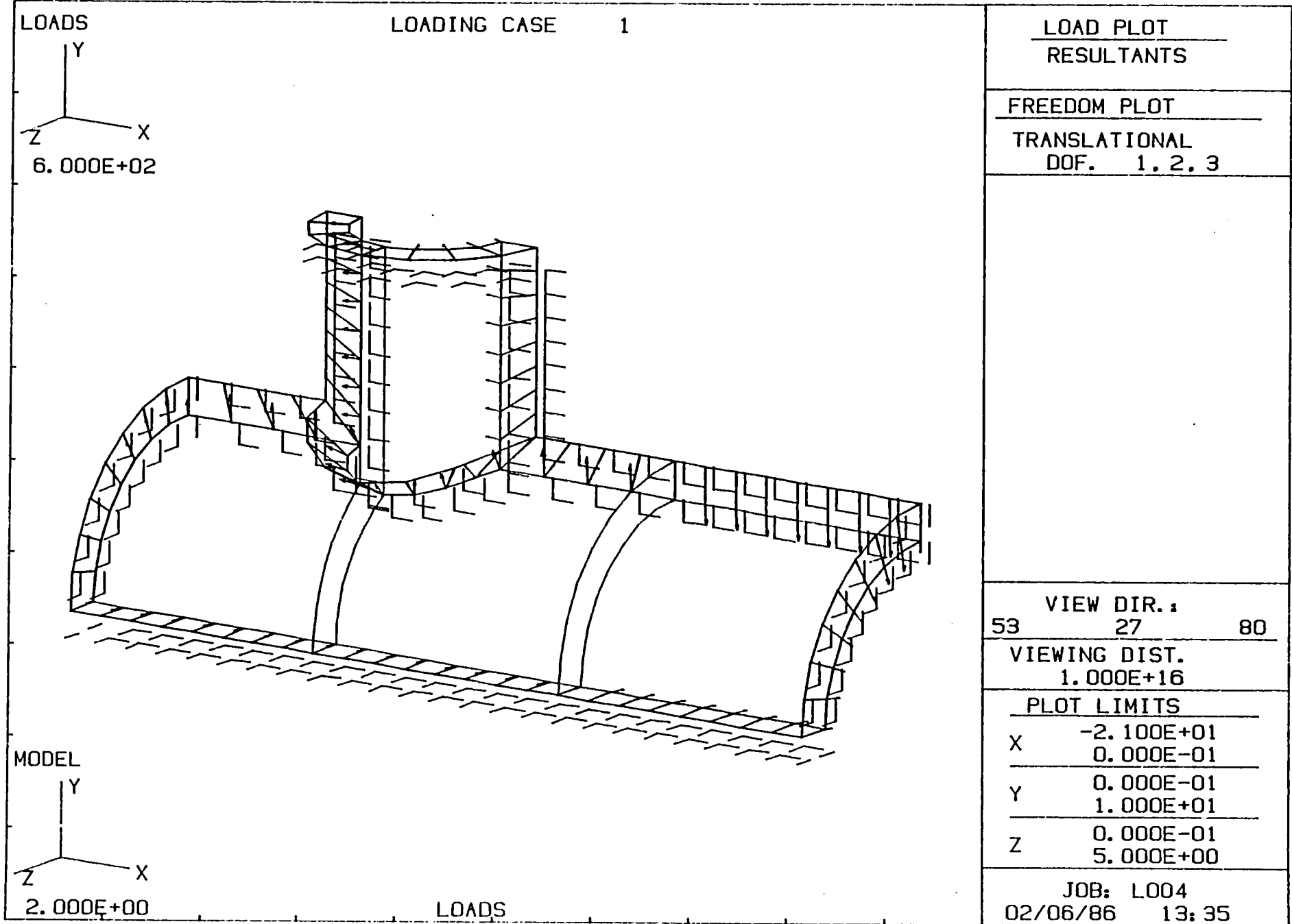
Y	0.000E-01	1.000E+01
---	-----------	-----------

Z	0.000E-01	5.000E+00
---	-----------	-----------

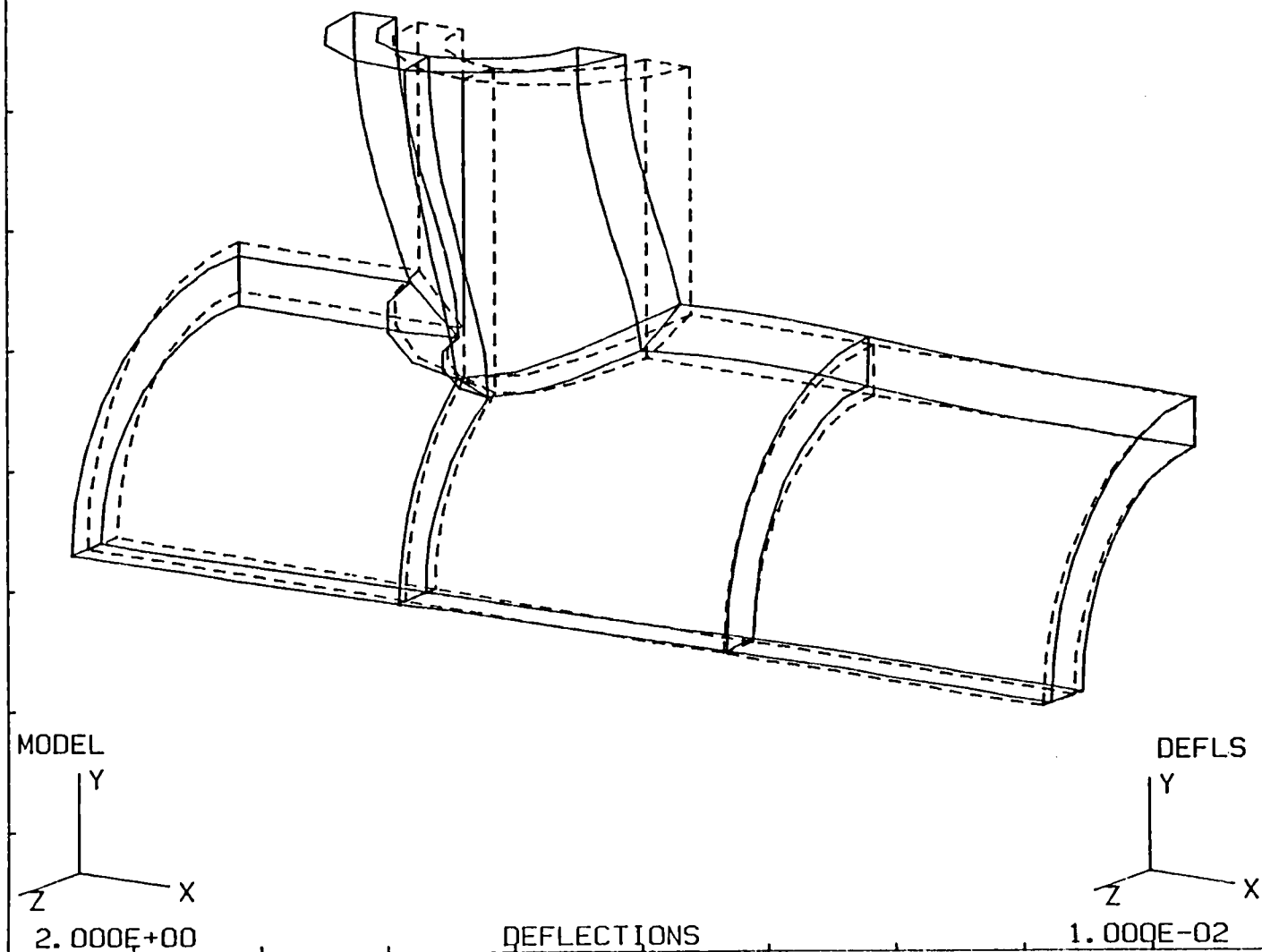
JOB: L004
02/06/86 11:47

Pre-Processing: Element Slice With Element Numbers (Elements Shrunk 20% For Display)





LOADING CASE 1



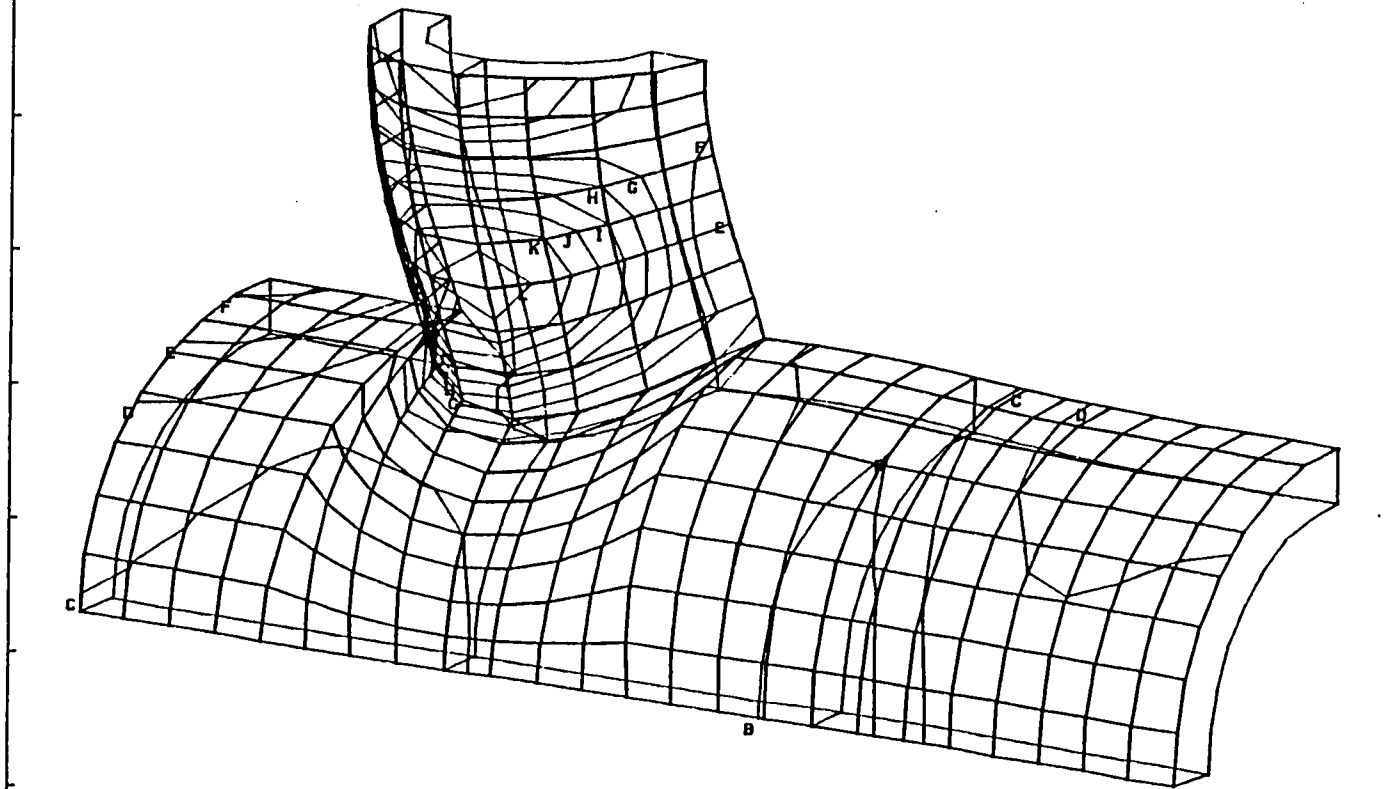
VIEW DIR.:		
53	27	80
VIEWING DIST.		
1.000E+16		
PLOT LIMITS		
X	-2.100E+01	
	0.000E-01	
Y	0.000E-01	
	1.000E+01	
Z	0.000E-01	
	5.000E+00	
JOB: L004		
02/06/86		13:39

Post-Processing: Deflections Superposed on Undeformed Shapes

LOADING CASE 1

STRESS CONTOURS

A	2.000E+00
B	4.000E+00
C	6.000E+00
D	8.000E+00
E	1.000E+01
F	1.200E+01
G	1.400E+01
H	1.600E+01
I	1.800E+01
J	2.000E+01
K	2.200E+01
L	2.400E+01



MODEL
Y
Z X
2.000E+00

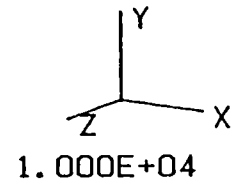
DEFL. AND STRESSES (MIDDLE)

DEFLS
Y
Z X
1.000E-02

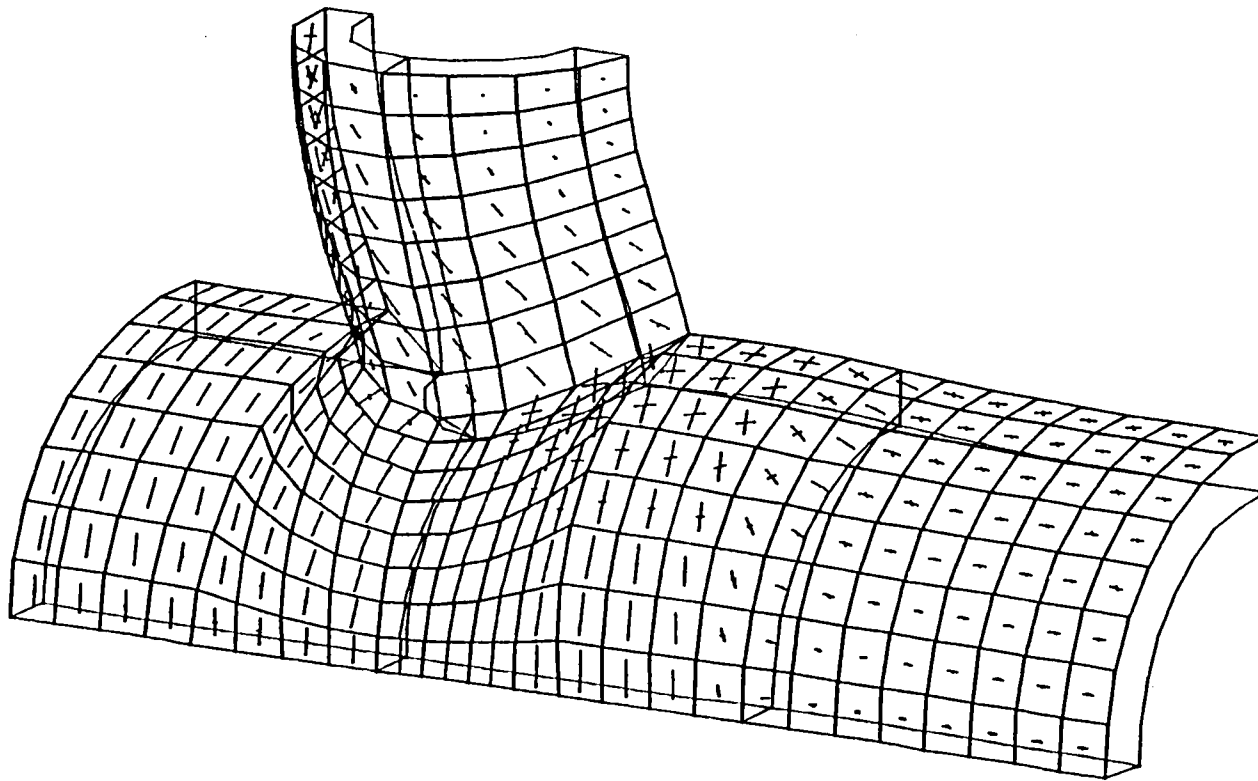
JOB: L004
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LOADING CASE 1

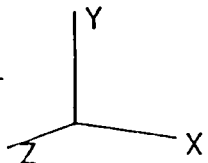
STRESS



PRINCIPAL
STRESSES
TENSILE

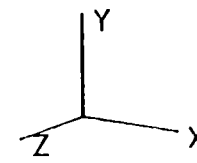


MODEL



2.000E+00

DEFLS



1.000E-02

DEFL. AND STRESSES (MIDDLE)

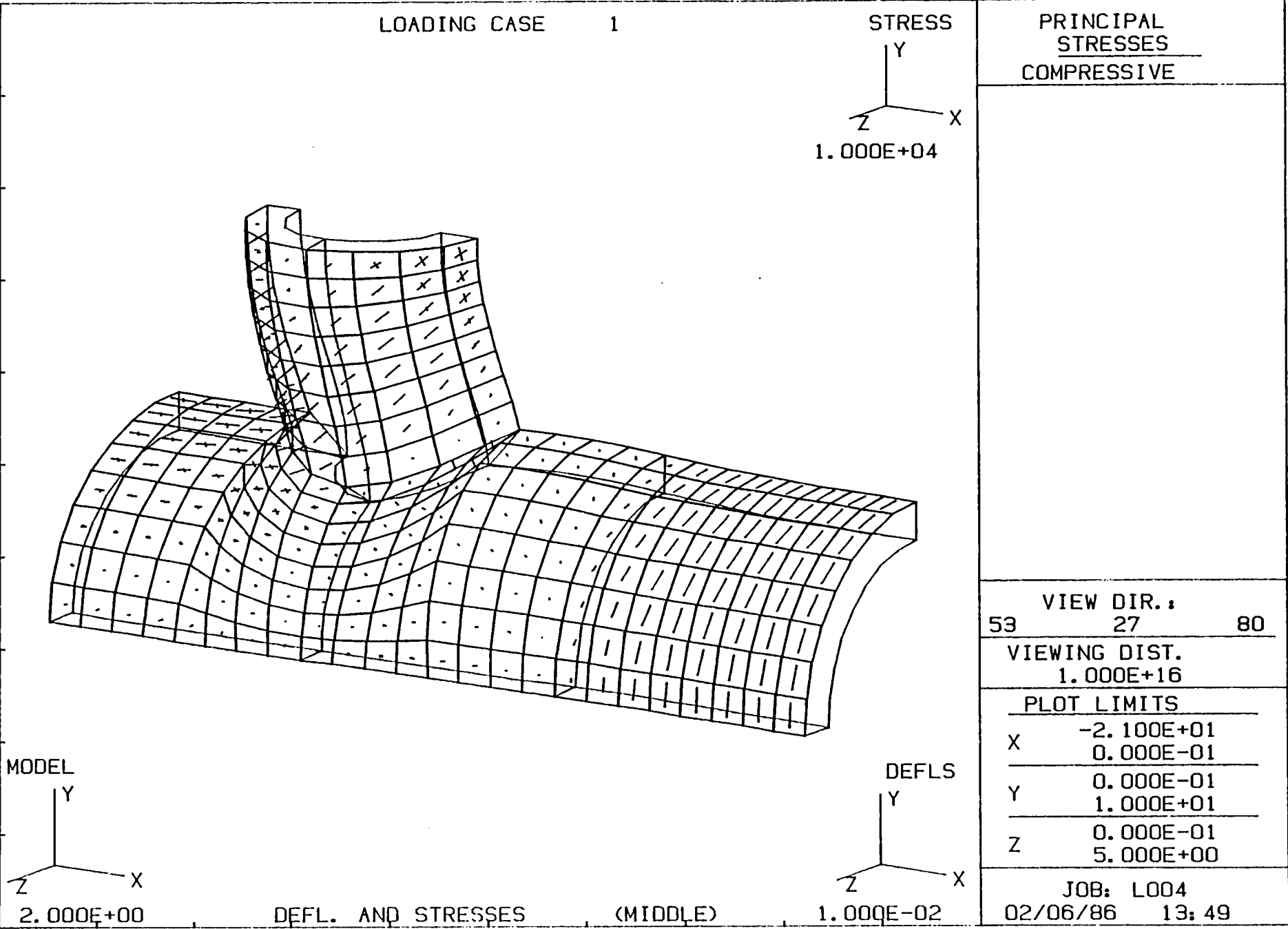
VIEW DIR.:
53 27 80

VIEWING DIST.
1.000E+16

PLOT LIMITS

X	-2.100E+01
	0.000E-01
Y	0.000E-01
	1.000E+01
Z	0.000E-01
	5.000E+00

JOB: L004
02/06/86 13:48



Post-Processing: Compressive Stresses on a Point Slice

INFG		02/06/86		11:40:58		PAGE 1	
JOB:L004		BOUNDARY LINES		CNTR	SURF	ELTS	STIFFNERS
NG	NAME	TYPE		PT	TYP	MN	TN
1	G1	GRID4	L56	L511	NONE	0	0
			L1112	L612			
2	G2	GRID4	L56	C15	NONE	0	0
			L12	C26			
3	G3	GRID4	L12	L17	NONE	0	0
			L78	L28			
4	G4	GRID4	L78	C711	NONE	0	0
			L1112	C812			
5	G5	GRID4	L17	C15	NONE	0	0
			L511	C711			
6	G6	GRID4	L28	C26	NONE	0	0
			L612	C812			
7	G7	GRID4	L1112	L1125	NONE	0	0
			L2526	L1226			
8	G8	GRID4	L78	L721	NONE	0	0
			L2122	L822			
9	G9	GRID4	L2122	C2125	NONE	0	0
			L2526	C2226			
10	G11	GRID4	C711	L721	NONE	0	0
			C2125	L1125			
11	G12	GRID4	C812	L822	NONE	0	0
			C2226	L1226			
12	G13	GRID4	L1521	C1315	NONE	0	0
			L1319	C1921			
13	G14	GRID4	L1920	L1319	NONE	0	0
			L1314	L1420			
14	G15	GRID4	C1416	L1420	NONE	0	0
			C2022	L1622			
15	G16	GRID4	L1516	L1521	NONE	0	0
			L2122	L1622			
16	G17	GRID4	L1314	C1315	NONE	0	0
			L1516	C1416			
17	G18	GRID4	C1921	L1920	NONE	0	0
			C2022	L2122			
18	G19	GRID4	L1723	C1517	NONE	0	0
			L1521	C2123			
19	G20	GRID4	L1622	C1618	NONE	0	0
			L1824	C2224			
20	G21	GRID4	L1718	L1723	NONE	0	0
			L2324	L1824			

INFS		02/06/86		11:41:04		PAGE 1	
JOB:L004		BOUNDARY GRIDS				ELTYP NMAT	
NS	NAME	TYPE					
1	S1	BRICK	G1	G3	G2	G5	SLD8 1
			G4	G6			
2	S2	BRICK	G24	G25	G9	G27	SLD8 1
			G26	G28			
3	S3	BRICK	G13	G15	G16	G18	SLD8 2
			G14	G17			
4	S4	BRICK	G7	G8	G4	G11	SLD8 1
			G9	G12			
5	S5	BRICK	G19	G20	G21	G23	SLD8 2
			G16	G22			

Sample GIFTS Information Command Output
For Grids and Solids